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| EXAMINER | |
|---|---|
| ONEILL, KARIE AMBER | |
| **ART UNIT** | **PAPER NUMBER** |
| 1745 | |

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
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| 3 MONTHS | 01/26/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/616,457 | HERRMANN, MANFRED | |
| | Examiner | Art Unit | |
| | Karie O'Neill | 1745 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *11-03-2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-25,30-33 and 44-51* is/are pending in the application.

4a) Of the above claim(s) *49-51* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25,30-33 and 44-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

1. The Applicant's amendment filed on November 3, 2006, was received. Claims 1, 6, 8-10, 12, and 33 were amended. Claims 26-29 and 34-43 have been cancelled. Claims 47-51 have been added.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued on August 3, 2006.

### *Election/Restrictions*

3. Newly submitted Claims 49-51are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: The subject matter of the aforementioned claims is a "method for investigation of a fuel cell system comprising testing the operation of said fuel cell system at low current yield", which has a different mode of operation than the "method for investigation of a fuel cell system comprising a first test" comprising a), b), c) and d) as recited in the original claims.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 49-51 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

***Claim Rejections - 35 USC § 112***

4. The Claim rejections under 35 U.S.C. 112, second paragraph, with regard to Claim 12 is withdrawn, because the independent Claim 12 has been amended.

***Claim Rejections - 35 USC § 102***

5. The claim rejections on Claims 1-3, 10, 13-14 and 46-48 under 35 U.S.C. 102(e) as being anticipated by Condit et al. (US 6,635,370 B2) are maintained.

With regard to Claims 1 and 46, Condit et al. disclose in Figure 1, a method for the investigation of a fuel cell system, said fuel cell system (100) having an anode (104) side to which a fuel is supplied in operation and a cathode side (106) to which an oxidizing agent is supplied in operation and comprising at least one fuel cell (102), each fuel cell having an anode, a cathode and a membrane (108) separating said cathode from said anode, said method being adapted to carry out a first test comprising the test of testing an operation of said fuel cell system at a low current yield or a shut-down procedure, said first test being carried out with a mixture of at least one inert gas with at least fuel permissible for the operation of said fuel cell system, said mixture being supplied to said anode side of said fuel cell system and the amount of fuel in the mixture being predetermined such that a proportion of said fuel present in said mixture lies below a value at which mixture is flammable in air (column 1 lines 54-60)., and wherein said tests are conducted in an ambient environment, thus outside of a test chamber.

With regard to Claims 2 and 3, Condit et al. disclose wherein said mixture includes at least 0.00001% hydrogen and the balance being inert gas, preferably

nitrogen (column 1 lines 55-58). Condit et al. also disclose that it is preferred to maintain a hydrogen concentration of 4% or less (column 3 lines 6-24).

With regard to Claim 10, Condit discloses wherein a plurality of fuel cells are combined together to form said fuel cell system in the form of a fuel cell stack and at least one first test, to test an operation of said fuel cell system at a low current yield or during the shut-down procedure, is carried out at said fuel cell stack (column 5 lines 12-14).

With regard to Claims 13-14, Condit et al. discloses the fuel cell system comprising at least first and second inlets (124, 130) and at least first and second outlets (126, 132) as well as a plurality of valves which are regulatable (139a, 141a, 158, 162) at least one of which is associated with each said inlet and outlet, there being lines communicating with said valves (139, 141, 160, 164), wherein a quantity of said mixture is fed into the fuel cell system, quantity is measured and valves are switched on and off in accordance with at least one of a predetermined pattern and a predetermined sequence, a measurement is made of a quantity of said mixture emerging from at least some of said lines, a sum is formed of emerging quantities and is compared with fed-in quantity to determine leakages (column 8 lines 26-40).

With regard to Claims 47-48, Condit et al. disclose in Figure 1, a method for the investigation of a fuel cell system, said fuel cell system (100) having an anode (104) side to which a fuel is supplied in operation and a cathode side (106) to which an oxidizing agent is supplied in operation and comprising at least one fuel cell (102), each fuel cell having an anode, a cathode and a membrane (108) separating said cathode

from said anode, said method being adapted to carry out a first test comprising the test of testing an operation of said fuel cell system at a low current yield or a shut-down procedure, said first test being carried out with a mixture of at least one inert gas with at least fuel permissible for the operation of said fuel cell system, said mixture being supplied to said anode side of said fuel cell system and the amount of fuel in the mixture being predetermined such that a proportion of said fuel present in said mixture lies below a value at which mixture is flammable in air (column 1 lines 54-60), and wherein said tests are conducted outside of a test chamber wherein the mixture comprises at least 0.00001% hydrogen and the balance being inert gas, preferably nitrogen (column 1 lines 55-58), and more preferably a hydrogen concentration of 4% or less (column 3 lines 6-24) which is considered close to being substantially 5% fuel and 95% inert gas. Condit et al., do not specifically point out that the test are conducted outside of a test chamber, however, it is the position of the examiner that a reference that is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999).

6. The claim rejections on Claims 1, 7-8, 10, 22-25 and 44-46 under 35 U.S.C. 102(e) as being anticipated by Bailey et al. (US 6,638,650 B1) are maintained.

With regard to Claims 1, 10 and 46, Bailey et al. discloses in Figures 1 and 2, a method for the investigation of a fuel cell system, said fuel cell system (102) having an anode side to which a fuel is supplied in operation and a cathode side to which an

oxidizing agent is supplied in operation and comprising at least one fuel cell (108a, 108b, 108c, 108d), each fuel cell having an anode, a cathode and a membrane (111a 110b, 110c, 110d) separating said cathode from said anode, said method being adapted to carry out a first test comprising the test of detecting transfer leaks within a plurality of fuel cells (see abstract), said first test being carried out with a mixture of at least one inert gas with at least fuel permissible for the operation of said fuel cell system, said mixture being supplied to said anode side of said fuel cell system and the amount of fuel in the mixture being predetermined such that a proportion of said fuel present in said mixture lies below a value at which mixture is flammable in air (column 1 lines 43-50), and wherein said tests are conducted in an ambient environment, thus outside of a test chamber.

With regard to Claims 7-8, Bailey et al. disclose in column 3 lines 22-24, the fuel cells being typically checked for leaks prior to operating the fuel cell, for example, after assembly or during routine maintenance.

With regard to Claims 22-25, Bailey et al. disclose in column 9 lines 5-15, the voltage across at least one of the fuel cells in the stack is measured. Absent a reactant transfer leak, the fuel cells in the stack will generate a constant voltage dependant upon the concentration of reactants in the fuel cell and the load, in any connected to the fuel cell. A reactant transfer leak will introduce oxidant and result in a mixed potential at the anode, which may result in a measurable drop in cell voltage that can be detected by the voltmeter. The cell voltage of a given cell is compared to the cell voltages of other

cells in the stack or a reference cell voltage. If the measured cell voltage is significantly less than the comparison cell voltage, then a reactant transfer leak is indicated.

With regard to Claims 44-45, Bailey et al. disclose the inert gas comprising nitrogen and the fuel comprises hydrogen (column 1 lines 42-48); and supplying the gases through separate gas sources having independent pressure regulation, as well as other arrangements that suitable (column 17 lines 18-25), such as supplying the gas mixture from a mixture tank in order to have better control over the mixture being supplied as well as saving space in the fuel cell system.

***Claim Rejections - 35 USC § 103***

7. The rejection of Claims 4-5 and 11-12 under 35 U.S.C. 103(a) as being unpatentable over Bailey et al. (US 6,638,650 B1), as applied to Claims 1, 8, 10, 22-25 and 44-46 above and in further view of Knights et al. (US 6,492,043 B1) are maintained.

Bailey et al. disclose the method of investigation of a fuel cell system to detect a leak within the fuel cell system in paragraph 6 above, but do not disclose the first test being carried out in an environment with a normal air atmosphere, an environment with normal ventilation, and the fuel cell system comprising at least first and second inlets and at least first and second outlets wherein, during the carrying out of the first test, said mixture if filled at a predetermined test pressure into said fuel cell system through one of said inlets and outlets, with simultaneous, previous or subsequent closing of further ones of said inlets and said outlets out of which ab exit of said mixture could take place

and wherein a measurement is made whether said test pressure reduces impermissibly as a function of time.

With regard to Claims 4-5, Knights et al. disclose that in order to detect external leaks between a fuel cell fluid passage and the external environment, the monitored environment may be the surrounding environment outside the cell (column 8 lines 24-26). Therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to carry out tests of the Bailey et al. reference in the environment suggested by Knights et al., because Knights et al. teache that the environment outside of the fuel cell would be in a normal air atmosphere and have proper ventilation so as not to reduce fuel cell performance and efficiency.

With regard to Claims 11 and 12, Knights et al. disclose introducing gas into the inlet of one of the fluid passages while the outlet is sealed. The other fuel cell fluid passage inlets are sealed. Therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to test for leaks within the fuel cell system as in the Bailey et al. reference by simultaneously, previously or subsequently closing further ones of inlets and outlets as in the Knights et al. reference, because Knights et al. teache that isolation each of the inlets and outlets will help determine where the leak is coming from. The reference is silent as to the predetermined test pressure in comparison to the operating pressure. However, it is the position of the examiner that the criticality of the pressure during test mode and normal operation does not provide patentable distinction.

8. The claim rejections of Claims 6-7, 9, 18-21, 30-32 and 46 under 35 U.S.C. 103(a) as being unpatentable over Condit et al. (US 6,635,370 B2), as applied to Claims 1-3, 10, 13-14 and 46-48 above, or over Bailey et al. (US 6,638,650 B1), as applied to Claims 1, 8, 10, 22-25 and 44-46 above.

With regard to Claims 6-7, 9 and 46, Condit et al. disclose the method of investigation for a fuel cell system in paragraph 5 above and Bailey et al. disclose the method of investigation of a fuel cell system in paragraph 6 above, but neither reference discloses at least one of said tests being carried out during or after manufacture of a vehicle incorporating said fuel cell system as a source of propulsion in order to test operability of said vehicle at a time of manufacture, wherein the first test is carried out in a workshop after repair of a vehicle containing said fuel cell system, wherein at least one of the tests is carried out on a test bed during development of said fuel cell system and the test is carried out without a test chamber. Therefore, it would have been obvious to a person of ordinary skill in the art to perform these method steps in any order since it can be held that the selection in which the process steps are carried out has little patentable weight when not distinctly claimed (MPEP 2144).

With regard to Claims 18-21, Condit et al. disclose the method of investigation for a fuel cell system in paragraph 5 above and Bailey et al. disclose the method of investigation of a fuel cell system in paragraph 6 above, but neither reference discloses the method in which at least one of the tests is carried out as a long term test, including a plurality of switching on or switching off processes of said valves, further including at lest one regulating valve having at least one set value, wherein said long-term test also

includes changes of said set value, and also including a plurality of heating up and cooling down cycles of said fuel cell system. Therefore, it would have been obvious to a person of ordinary skill in the art to perform these method steps as long term tests so as to be able to monitor, measure and evaluate the severity of the leakage, identify small leaks which may not show up during one test run and/or to narrow down the specific cell in which leakage is occurring.

With regard to Claims 30-32, Condit et al. disclose the method of investigation for a fuel cell system in paragraph 5 above and Bailey et al. disclose the method of investigation of a fuel cell system in paragraph 6 above, but neither reference discloses after successfully concluded tests occurs, a second test is carried out in the same manner as the first test. Therefore, it would have been obvious to one of ordinary skill in the art to perform a second test in the same manner as the first test, by using a different amount of gas mixture being fed into the fuel cell system to determine a different power yield of the system, in order to determine of the results of the first and second tests are similar or accurate.

9. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Condit et al. (US 6,635,370 B2), as applied to Claims 1-3, 10, 13-14 and 46-48 above, and in further view of Bailey et al. (US 6,638,650 B1).

Condit et al. disclose the method investigation for a fuel cell system in paragraph 5 above, but do not disclose wherein a development in time of said difference value is

compared with a said predetermined pattern in order to associate any eventually present leakage source or a plurality of leakage sources.

Bailey et al. disclose the fuel cell system comprising first and second inlets (136, 126) and a plurality of valves which are regulatable (column 9 lines 2-3) at least one of which is associated with each said inlet and outlet, there being lines communicating with said valves, wherein a quantity of said mixture is fed into the fuel cell system, quantity is measured and valves are switched on and off in accordance with at least one of a predetermined pattern and a predetermined sequence, a measurement is made of a quantity of said mixture emerging from at least some of said lines, a sum is formed of emerging quantities and is compared with fed-in quantity to determine leakages (column 9 lines 10-15 and 24-33). Therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to compare a time difference with a predetermined pattern in order to identify leakage in the Condit et al. fuel cell system, because Bailey et al. teach preventing degradation of the fuel cell system when leakage occurs.

10. Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Condit et al. (US 6,635,370 B2), as applied to Claims 1-3, 10, 13-14 and 46-48 above, or over Bailey et al. (US 6,638,650 B1), as applied to Claims 1, 8, 10, 22-25 and 44-46 above, and in further view of Tomimatsu et al. (US 5,595,832).

Condit et al. disclose the method of investigation for a fuel cell system in paragraph 5 above and Bailey et al. disclose the method of investigation of a fuel cell

system in paragraph 6 above, but neither reference discloses expressly wherein said fuel cell system is heated to one of an operating temperature and an excess temperature prior to and during the carrying out of any one of said tests.

Tomimatsu et al. disclose, the fuel cell being heated to an operating temperature (column 8 lines 55-56) and under a high temperature (column 11 line 16) prior to testing for a gas-crossleak amount at the exhaust output of the cathode (column 22 lines 20-30). Therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to heat the fuel cell of Condit et al. or Bailey et al. to an operating temperature and a higher temperature prior to and during the carrying out of any of the tests, because Tomimatsu et al. teaches the method of making sure that the fuel cell operates at a maximum temperature and is fully functional before an investigative test is performed.

11. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over Condit et al. (US 6,635,370 B2), as applied to Claims 1-3, 10, 13-14, and 46-48 above, and in further view of Meltser et al. (US 5,763,113) on Claim 33 is maintained.

Condit et al. disclose the method of investigation for a fuel cell system in paragraph 5 above, but do not disclose expressly wherein at least one of a fuel sensor and an inert gas sensor is used in order to determine any leakages of said mixture.

Meltser et al. disclose in column 4 lines 49-52, as part of the hydrogen leakage alert system, a hydrogen sensor communicates with the cathode exhaust gas manifold for measuring hydrogen concentration therein. Therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to use a hydrogen sensor as

in the Meltser et al. reference as part of the fuel cell system of Condit et al., because Meltser et al. teache monitoring the amount of hydrogen seepage through the membrane into the cathode flow channel so as to catch the problem of leakage before it causes inefficiency in the fuel cell operation (column 4 lines 33-38).

***Response to Arguments***

12. Applicant's arguments filed November 3, 2006, have been fully considered but they are not persuasive.

13. *Applicant's principal arguments are:*

*(a) Condit et al. does not teach "wherein the mixture comprises substantially 95% $N_2$ and 5% $H_2$".*

*(b) Bailey et al. fails to suggest wherein the "portion of said fuel present in said mixture lies below a value at which the mixture is flammable in air".*

*(c) Condit et al. and Bailey et al. fail to suggest the tests being conducted outside of a test chamber.*

In response to Applicant's arguments, please consider the following comments:

(a) Condit et al. disclose in Claim 8 that the hydrogen concentration within the fuel cell is at a concentration between 0.0001% and 10%, the balance being inert gases.

(b) Bailey et al. does not disclose actual values for which the portion of fuel is present in the system. However, it is the position of the examiner that the fuel

mixture is not flammable in air because both Condit et al. and the instant application utilize the same mixture composition.

(c) Neither Condit et al. nor Bailey et al. disclose that the tests are conducted inside of a test chamber because the tests are conducted in ambient. Therefore, no test chamber was involved in the tests conducted in either reference.

***Conclusion***

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karie O'Neill whose telephone number is (571) 272-

8614. The examiner can normally be reached on Monday through Friday from 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Karie O'Neill
Examiner
Art Unit 1745

KAO

DAH-WEI YUAN
PRIMARY EXAMINER